Leuze electronic

the sensor people

L100
Safety Locking Device

GB 2008/12 607310
We reserve the right to
make technical changes

SAFE IMPLEMENTATION AND OPERATION

1 About this document

1.1 Other applicable documents

The information on the L100 Safety Locking Device is divided into two documents. Document "Application information" contains only the most important safety notices.

↳ For the safe implementation, testing and operation, download document "Safe implementation and operation of the L100" from http://www.leuze.com/l100 or request it from service.schuetzen@leuze.de or tel. +49 8141 5350-111.

Table 1.1: Documents for the L100 Safety Locking Device

Purpose and target group	Title	Source
Detailed information for all users	Safe implementation and operation (this document)	On the Internet, download from: http://www.leuze.com/l100
Basic information for technicians and machine operators	Application information	Print document part no. 607244 included in the delivery contents of the product

1.2 Used symbols and signal words

Table 1.2: Warning symbols and signal words

	Symbol for dangers
NOTICE	Signal word for property damage Indicates dangers that may result in property damage if the measures for danger avoidance are not followed.
CAUTION	Signal word for minor injury Indicates dangers that may result in minor injury if the measures for danger avoidance are not followed.
WARNING	Signal word for severe injury Indicates dangers that may result in severe or fatal injury if the measures for danger avoidance are not followed.
DANGER	Signal word for life-threatening danger Indicates dangers that will result in severe or fatal injury if the measures for danger avoidance are not followed.

Table 1.3: Other symbols

	Symbol for tips Text passages with this symbol provide you with further information.
	Symbols for action steps Text passages with this symbol instruct you to perform actions.

2 Safety

Before using the Safety Locking Device, a risk evaluation must be performed according to valid standards (e.g. EN ISO 12100-1, EN ISO 13849-1, EN ISO 14121). For mounting, operating and testing, document "Safe implementation and operation of the L100" as well as all applicable national and international standards, regulations, rules and directives must be observed (e.g. machinery directive, low-voltage directive, work-equipment directive, safety regulations, accident-prevention regulations, EN 1088, EN ISO 13849-1, EN 60204-1, EN 954-1). Observe and print out relevant and supplied documents and distribute to the affected personnel.

↳ Before beginning work with the Safety Locking Device, completely read and understand the documents applicable to the respective task.

⚠ WARNING

Serious accidents may result if the voltage supply is interrupted!

If the voltage supply to the electromagnet of an electromagnetically locked Safety Locking Device is interrupted, the protective device may be opened immediately.

The following standards apply for the risk evaluation at the protective device prior to using the Safety Locking Device:

- EN ISO 14121, Safety of machinery, risk evaluation
- EN ISO 12100-1, Safety of machinery
- EN ISO 13849-1, Safety-related parts of control systems

The realizable category of the integration in control circuits according to EN ISO 13849-1 and EN 954-1 is dependent on the used contact block and wiring.

In particular, the following national and international legal regulations apply for the start-up, technical inspections and work with Safety Locking Devices:

- Machinery directive 2006/42/EC
- Low voltage directive 2006/95/EC
- Electromagnetic compatibility directive 2004/108/EC
- Use of work equipment directive 89/655 EEC
- Safety regulations
- Accident-prevention regulations and safety rules

2.1 Proper use

To ensure proper personnel protection, the Safety Locking Device must be mounted, connected and started-up by trained personnel. It must be in perfect condition and inspected regularly. The switching process must only be triggered by an actuator approved for this Safety Locking Device that is connected to the moveable guard in a non-detachable and tamperproof manner.

The rules and regulations for protection and safety at work and the recognised safety-related rules and regulations must be observed. These include:

- EN 1088, Interlocking devices associated with guards
- EN ISO 13849-1, Safety-related parts of control systems
- EN 60204-1, Electrical equipment of machines

L100 Safety Locking Devices must be connected in such a way that a dangerous state can only be activated while the protective device is closed and so that they prevent premature opening during the lag time before the dangerous state has ended. Electromagnetic Safety Locking Devices may only be used instead of spring-locked Safety Locking Devices in exceptional cases and following appropriate risk evaluation.

Connection conditions:

- dangerous state can be activated only with closed protective device and locked locking device
- protective device cannot be opened while locking device is locked

Furthermore, the L100 Safety Locking Device must **not** be used under the following conditions:

- high concentration of dust particles in the surrounding area
- rapidly changing ambient temperature (leads to condensation)
- in the event of strong physical shocks
- in explosive or easily flammable atmospheres
- the mounting locations are not sufficiently stable
- in the event of electromagnetic interference
- the safety of multiple persons is dependent on the function of this Safety Locking Device (e.g. nuclear power plants, trains, aircraft, motor vehicles, incinerators, medical devices)

Handling the Safety Locking Device:

- Never unlock the Safety Locking Device before the dangerous state has ended.
- Observe the permissible environmental conditions for storage and operation (see chapter 14 "Technical data").
- Immediately replace damaged Safety Locking Devices according to these instructions.

- Use cable gland, insulation materials and connecting wires of the appropriate protection rating.
- Protect the Safety Locking Device from penetrating foreign bodies (e.g. shavings, sand and blasting agent).
- Before performing painting work, cover the actuation slot, actuator and name plate.
- Immediately clean any contamination from the Safety Locking Device that impacts function according to these instructions.
- Make no structural changes to the Safety Locking Device.

2.2 Competent personnel

Prerequisites for competent personnel:

- suitable technical training
- knows the rules and regulations for occupational safety, safety at work and safety technology and can assess the safety of the machine
- knows the instructions for the Safety Locking Device and the machine
- was instructed by the responsible individuals on the mounting and operation of the machine and of the Safety Locking Device

2.3 Responsibility for safety

Manufacturer and operator of the machine must ensure that the machine and implemented Safety Switch function properly and that all affected persons are adequately informed and trained.

The type and content of all imparted information must not lead to unsafe actions by users.

The manufacturer of the machine is responsible for:

- safe machine construction
- safe implementation of the Safety Locking Device
- imparting all relevant information to the operator
- adhering to all regulations and directives for the safe starting-up of the machine

The operator of the machine is responsible for:

- instructing the operating personnel
- maintaining the safe operation of the machine
- adhering to all regulations and directives for occupational safety and safety at work
- regular testing by competent personnel

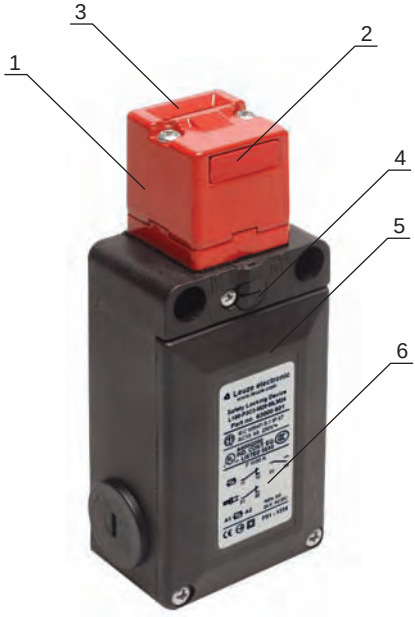
2.4 Exemption of liability

Leuze electronic GmbH + Co. KG is not liable in the following cases:

- Safety Locking Device is not used as intended
- safety notices are not adhered to
- mounting and electrical connection are not properly performed
- proper function is not tested (see chapter 9 "Testing")
- modifications are made to the Safety Locking Device

3 Device description

The Safety Locking Device of the L100 series is an electro-mechanical switching device in a housing made of glass-fibre-reinforced and non-combustible plastic; the device satisfies protection rating IP 66. By means of the funnel-shaped insertion opening, the actuator self-centres, even if the door is slightly misadjusted. The magnet switched currents can be reduced for both variants (adjustable via a switch). The spring-actuated model (L100-P3C3-M20-SLM24) is equipped with an auxiliary release located below the deflection head.



1 Deflection head
2 Dust cover
3 Insertion opening for actuator
4 Auxiliary release (L100-P3C3-M20-SLM24)
5 Housing cover
6 Name plate (connection data, production code and year of manufacture)

Table 3.1: L100 Safety Locking Devices

Article	Part No.	Description
L100-P3C3-M20-SLM24	63000 600	Mechanical locking (spring force), manual auxiliary release
L100-P3C3-M20-MLM24	63000 601	Electromagnetic locking

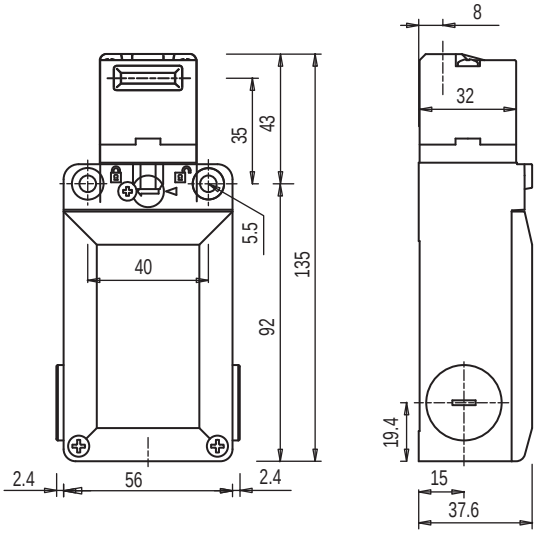


Figure 3.1: Dimensions L100-P3C3-M20-SLM24 in mm

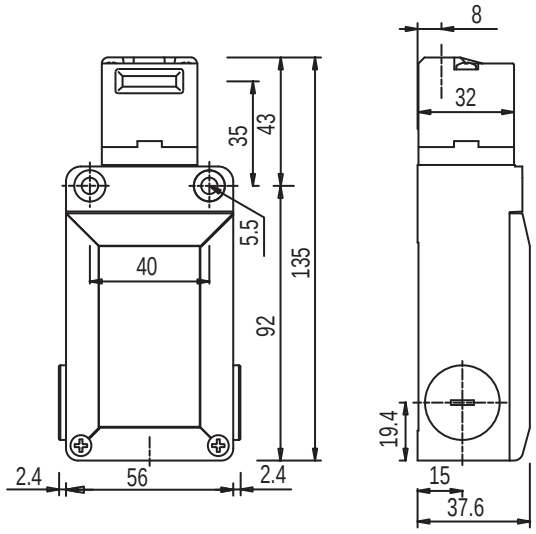


Figure 3.2: Dimensions L100-P3C3-M20-MLM24 in mm

The deflection head can be turned in 90° increments and set to 5 approach directions. A selection of different actuators ensures that the Safety Locking Device can be mounted in any position.

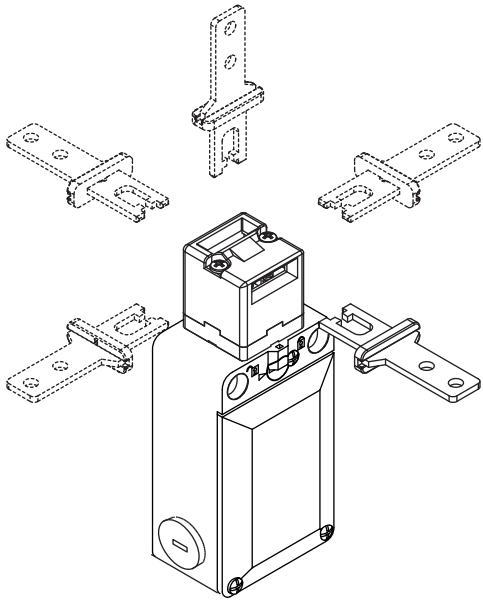


Figure 3.3: Approach directions

4 Functions

4.1 Spring locking

With the **L100-P3C3-M20-SLM24**, the safety contacts close when the actuator moves in; the actuator is mechanically held in the locked position by the spring force. The dangerous process can be activated via the safety switching device.

After the dangerous process has stopped, the operating voltage for unlocking the electromagnet is applied and the actuator is released. The protective device can be opened. In the event of failure of the operating voltage, release is also possible via the auxiliary release.

4.2 Electromagnetic locking

With the **L100-P3C3-M20-MLM24**, the safety contact for the position monitoring of the protective device closes when the actuator is moved in. The electromagnet is energised and holds the actuator in the locked position. The dangerous process can be activated via the safety switching device.

On release, the voltage supply to the electromagnet is interrupted. The electromagnet releases the actuator and the protective device can be opened.

5 Applications

Safety Locking Devices with spring locking are suitable for e.g. position monitoring and locking the following protective devices:

- turning or swivelling moveable guards
- laterally moveable protective gratings or sliding gates

Safety Locking Devices with electromagnetic lock are used primarily as locks for moveable guards to prevent undesired process interruptions.

By means of the switched-current reduction option, larger systems can be equipped with multiple L100 Safety Locking Devices. With magnet activation, possible voltage peaks associated with switching on and off can be reduced in this way.

6 Mounting

WARNING

Serious accidents may result if the Safety Locking Device is not mounted properly!

The protective function of the Safety Locking Device is only ensured if used in the intended area of application and if it is mounted professionally.

- Mounting may only be performed by competent personnel.
- Observe standards, regulations and these instructions.
- Protect the housing and deflection head from materials penetrating the enclosure (environmental conditions see chapter 14 "Technical data").
- Test to ensure proper function.

6.1 Adjusting the deflection head

- Unscrew the 2 screws on the deflection head.
- Turn the deflection head in the desired direction.

- Tighten the 2 screws on the deflection head with 0.7–0.9 Nm.
- Close unused opening with the dust cover.

6.2 Mounting the Safety Locking Device

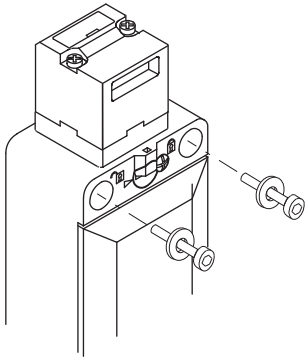
Prerequisites for mounting:

- deflection head has been set
- fully assembled

↳ Select the mounting location so that the following conditions are satisfied:

- Safety Locking Device and actuator can be well matched to one another and permanently mounted
- auxiliary release is accessible to qualified personnel
- accessible to qualified personnel for testing and replacement

↳ Position washers and screw down Safety Locking Device with 2–3 Nm.



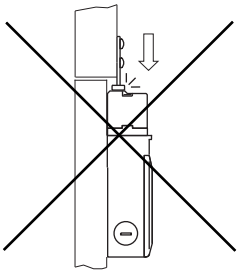
6.3 Mounting the actuator

NOTICE
The Safety Locking Device may be damaged if mounted improperly!
↳ Use separate mechanical limit stop for the moving part of the protective device.
↳ Align actuator so that it does not hit or rub against the edges of the insertion opening.

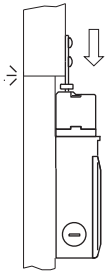
Prerequisites for proper function:

- actuator is not deformed or damaged
- actuator is appropriate for the Safety Locking Device
  Proper function is ensured only with original accessories (see chapter 13 "Accessories").

Wrong

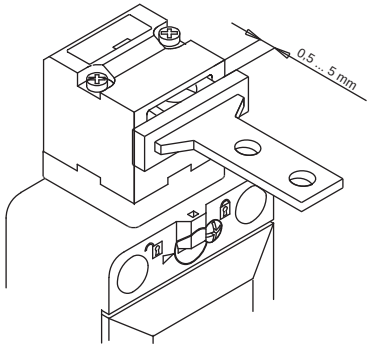


Correct



↳ Align actuator.

Play for the actuator in the closed state: 0.5–5 mm.



↳ Secure actuator with rivets or tamperproof screws so that it cannot be detached.

7 Electrical connection

WARNING

Serious accidents may result if the electrical connection is faulty!

- Electrical connection may only be performed by competent personnel.

7.1 Setting the switched-current reduction

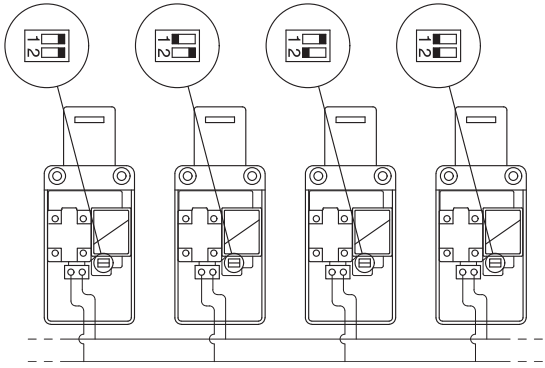
With magnet activation, this function enables the reduction of switch-on and switch-off peaks by splitting into up to 4 groups.

DANGER

Risk of death by electric shock!

- Interrupt the voltage supply to the Safety Locking Device.

- Unscrew the housing cover.
- Remove the two screws on the black protective cover of the electromagnet.
- Remove the protective cover.
- Use an appropriate tool to set the DIP switches of the Safety Locking Devices to different combinations (for more than 4 Safety Locking Devices, split uniformly).



- Mount the black protective cover and screw down with 0.8 Nm.
- Tighten the housing cover with 0.7–0.9 Nm.

7.2 Connecting the contact block

Prerequisites:

- temperature stability of the cable insulation material must be greater than the maximum temperature of the housing (see chapter 14 "Technical data")
- cable gland with appropriate protection rating
- maximum current load is observed (see chapter 14 "Technical data")

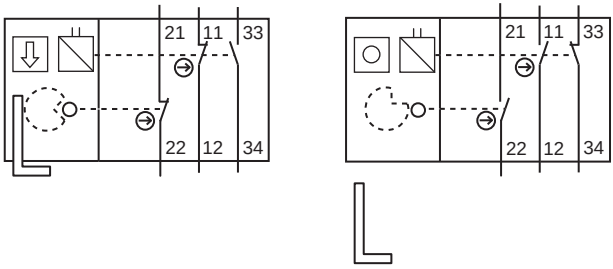


Figure 7.1: Contact block 2NC + 1NO (L100-P3C3-M20-SLM24, L100-P3C3-M20-MLM24)

DANGER

Risk of death by electric shock!

↳ Interrupt the voltage supply to the Safety Locking Device.

↳ Unscrew the housing cover.

↳ Connect the contact block according to the circuit diagram.

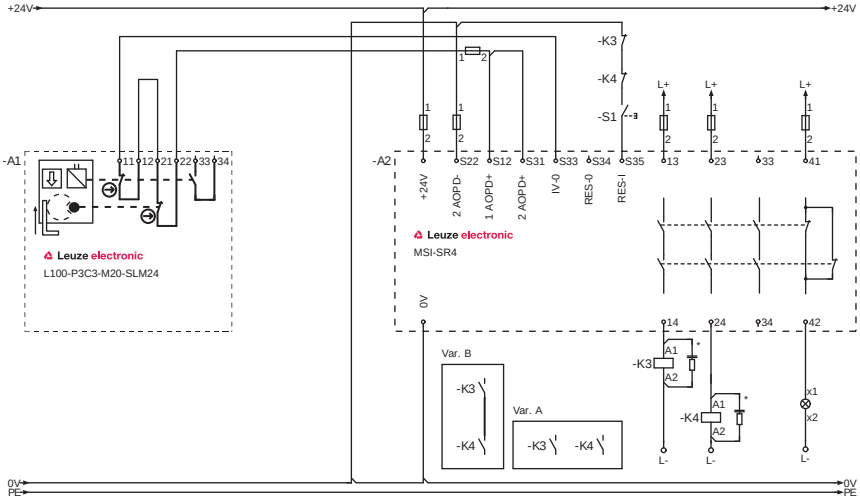
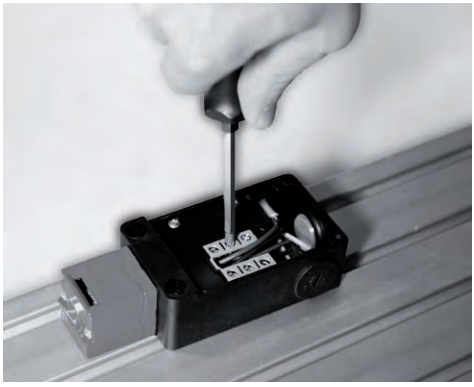


Figure 7.2: Connection example L100-P3C3-M20-SLM24 and L100-P3C3-M20-MLM24

↳ Tighten cable terminal screws with 0.6–0.8 Nm.



↳ Tighten the housing cover with 0.7–0.9 Nm.

8 Setting the device into service

WARNING

Serious accidents may result if the Safety Locking Device is unlocked prematurely!

- Before unlocking the Safety Locking Device and opening the protective device, wait until the dangerous state has ended.

Prerequisites:

- Safety Locking Device is mounted and connected according to these instructions
- operating personnel have been trained in the correct use

- Test the function of the Safety Locking Device (see chapter 9 "Testing").

The Safety Locking Device is then ready for use.

9 Testing

L100 Safety Locking Devices are maintenance free. Nevertheless, they must be replaced after maximum 800,000 switching cycles.

- Always replace the entire Safety Locking Device including actuator.
- For the testing intervals, observe nationally applicable regulations.
- Document all tests in a comprehensible manner.

9.1 To be performed prior to the initial start-up by competent personnel

- Check whether the Safety Locking Device is operated according to its specified environmental conditions (see chapter 14 "Technical data").
- Test to ensure proper mechanical and electrical function (see chapter 9.2).

9.2 To be performed periodically by competent personnel

Mechanical function

- Stop the dangerous state and open the protective device.
- Check that the components are securely fastened.
- Test the cable entry for leaks.

- Check Safety Locking Device and actuator for damage, deposits, deformation and wear.
- If present, test auxiliary release.
- Test several times whether the actuator can be easily moved into the Safety Locking Device.

Electrical function

WARNING

Severe injuries may result if tests are not performed properly!

- Make certain that there are no persons in the danger zone.

- Stop the dangerous state and open the protective device.
- Make certain that the machine cannot be started while the protective device is open.
- Close the protective device and start the machine.
- Make certain that the protective device cannot be opened until after the machine has been shut down and the Safety Locking Device has been released.
- Make certain that the dangerous state ends before the protective device can be opened.

9.3 To be performed daily by the operating personnel

WARNING

Severe injuries may result if tests are not performed properly!

- Make certain that there are no persons in the danger zone.

- Stop the dangerous state and open the protective device.
- Check the Safety Locking Device and actuator for damage or tampering.
- Make certain that the machine cannot be started while the protective device is open.
- Close the protective device and start the machine.
- Make certain that the protective device cannot be opened until after the machine has been shut down and the Safety Locking Device has been released.

10 Cleaning

There must be no soiling (e.g. shavings or dust) present, especially in the deflection head of the Safety Locking Device.

Prerequisites for cleaning:

- protective device is opened and machine is switched off
- voltage supply for the Safety Locking Device is interrupted

↳ Periodically clean the Safety Locking Device while the protective device is opened (e.g. with vacuum cleaner).

11 Disposing

↳ The nationally valid regulations for electro-mechanical components are to be observed when disposing.

12 Service and support

Contact data:

Leuze electronic GmbH + Co. KG
Liebigstraße 4
D-82256 Fürstenfeldbruck
Phone: +49 8141 5350-111

13 Accessories

Table 13.1: Actuators of the AC-AH series for the L100 Safety Locking Device

Article	Part No.	Description
AC-AH-S	63000 720	Straight
AC-AH-A	63000 721	Angled
AC-AH-F4	63000 722	Straight, flexible, 4 directions
AC-AH-F2J2	63000 723	Straight, flexible, 2 directions, alignable 2 directions
AC-AH-F1J2	63000 724	Straight, flexible, 1 direction, alignable 2 directions
AC-AH-F4J2-TK	63000 725	Straight, flexible, 4 directions, alignable 2 directions turning head

14 Technical data

Table 14.1: General

Switch type	Interlock device with locking according to EN 1088
Actuator, external	AC-AHxx series: straight, angled, spring-mounted, adjustable
Lock type	L100-P3C3-M20-SLM24: spring force L100-P3C3-M20-MLM24: electromagnetic
Lock actuation	L100-P3C3-M20-SLM24: spring L100-P3C3-M20-MLM24: electromagnet
Approach actuation directions	1 x above, 4 x side (90°)
Approach speed	min. 1mm/s, max. 0.5m/s
Actuation force (extraction)	30N
Mechanical life time according to IEC 60947-5-1	0.8 x 10^6 switching cycles
Actuation frequency in accordance with IEC 60947-5-1	max. 600 per hour
Life time according to EN ISO 13849-1	on request
Number of cycles until the dangerous failure (B10d) in accordance with EN 61810-2 with DC1 (ohmic load) with AC1 (ohmic load) with DC13 (inductive load) with AC15 (inductive load) low load (20% rated load)	on request
Usage category in accordance with EN 60947-5-1	AC 15 (Ue / Ie): 250V / 6A 400V / 4A 500V / 1A DC 13 (Ue / Ie): 24V / 6A 125V / 1.1A 250V / 0.4A
Dimensions (dimensional drawings)	see chapter 3 "Device description"

Table 14.2: Safety

Protection rating	IP 66
Contact protection	Protective insulation O
Recoil tolerance	4.5 mm
Locking force	max. 1100 N
Contact allocation	magnet: 1NC + 1NO, actuator: 1NC
Contact material	silver alloy
Switching principle	slow-action contact
Opening of contact	positive-forced
Rated insulation voltage	400 V AC
Conventional thermal current	max. 10 A
Short-circuit protection according to IEC 60269-1	1.0 A, 24 V, type aM (magnet) 10 A, 500 V, type aM (safety circuit)
Magnet operating voltage and tolerance	24 V DC (–10% to +25%)
Switch-on time	100%
Power consumption	average 20 VA
Switch-on power limit, adjustable	4-way

Table 14.3: Housing

Housing material	fiberglass-reinforced, thermo-plastic plastic, self-extinguishing

Table 14.4: Connection

Number of cable entries	3
Type of cable entry	M20 x 1.5
Conductor cross-section (stranded)	1 x 0.34 mm^2 to 2 x 1.5 mm^2

Table 14.5: Environment

Temperature range, operation	–25 ... +60 °C
Degree of contamination, external, according to EN 60947-1	3

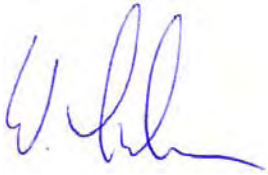
15 EC Declaration of Conformity

Leuze electronic GmbH + Co. KG
Liebigstraße 4
D-82256 Fürstenfeldbruck

We hereby declare that the L100 Safety Locking Device (see name plate for part no.) in the form in which it is marketed by us conforms with the relevant safety and health requirements of the listed EC directives [1] (including all changes) and that the listed standards [1] were used in its design and construction.

Fürstenfeldbruck, 15 September 2008

ppa. Dr. Holger Lehmitz
Director of the Safety Systems Division



ppa. Werner Lehner
Director of Product Management
Safety Systems Division